

# NRC INSPECTION MANUAL

INSPECTION PROCEDURE 88134

NMSS/FCSS

## PIPING SYSTEMS RELIED ON FOR SAFETY

PROGRAM APPLICABILITY: 2630

### 88134-01 INSPECTION OBJECTIVES

01.01 To determine whether the technical requirements detailed or referenced in the appropriate sections of the facility Construction Authorization Request (CAR), associated with Quality Level (QL)-1 and 2 piping have been adequately addressed in the construction specification, drawings and work procedures; and whether the established system of management controls is adequate.

01.02 To determine whether adequate plans, instructions and procedures have been established to implement the Quality Assurance program for QL-1 and QL-2 piping (except welding and nondestructive examination (NDE)) in accordance with the CAR and the MOX Project Quality Assurance Plan (QAP).

01.03 To determine whether specifications or procedural controls associated with QL-1 and QL-2 piping are adequate and determine whether any potentially generic problems or other weaknesses exist within the appropriate technical organization.

01.04 To determine whether activities relative to QL-1 and QL-2 piping (except welding and NDE) are being accomplished in accordance with NRC requirements, CAR commitments, and licensee/contractor procedures.

01.05 To determine whether inadequacies in completed work, partially completed work, or work activities in progress may indicate management control problems or generic weaknesses.

### 88134-02 INSPECTION REQUIREMENTS

Note: These requirements should be implemented so that each major contractor installing piping in QL-1 and QL-2 systems is inspected. The number of samples and attributes reviewed may be adjusted upon management approval dependent on the number of contractors and specific work being performed. Depending on the facility contracting arrangements, it may be appropriate to perform certain parts of IP 88135 (Piping Supports and Restraints) in conjunction with this procedure.

02.01 Determine whether CAR and QAP commitments relating to the following specific activities associated with QL-1 and QL-2 piping are adequately addressed in procedures included or referenced in the QA manual(s).

- a. Purchase documents identifying material specifications and any special requirements, including material test reports/certification of the following (as applicable):
  1. chemical composition
  2. physical characteristics
  3. nondestructive examination results
  4. heat treatment history (if applicable)
  5. welding of prefabricated sections
- b. Receipt inspections, including provisions for ensuring:
  1. piping materials are in conformance with purchase specifications, including special requirements
  2. marking, identification, and storage level classifications
  3. as-received cleanliness and protection
  4. receipt inspection reports are generated as required
  5. disposition of nonconforming items
- c. Inspections covering storage and issuance of the piping and related appurtenances including provisions for:
  1. segregation of sizes and types of material
  2. storage identification
  3. storage conditions/protection
  4. confirmation of issue of specified material
- d. Handling of the piping and related appurtenances to ensure protection from physical damage or contamination while handling.
- e. Installation of the piping and related appurtenances to verify that the following meet applicable requirements:

1. location
  2. grinding, cutting, bending, etc.
  3. piping system tolerances
  4. cold spring
  5. installation records to be generated during installation
  6. type, size, location and adjustment of hangers, bellows, restraints, snubbers
  7. clearances to prevent interference
  8. hydrostatic testing (where required)
  9. hold points
  10. removal of arc strikes
- f. Design changes, including field changes, to ensure proper review and coordination among participating design organizations.
- g. Inspection and work performance for cleaning piping, including provisions for:
1. cleaning materials - conformance to specifications, concentration, temperature, and use
  2. cleanliness criteria and measurement methods
  3. removal and installation of metering devices, orifice plates, valve internals, etc., that are removed from system to facilitate flushing
  4. installation and removal of fine strainers, blind flanges, temporary piping and dams
  5. record-keeping requirements

02.02 Review the licensee/contractor's plans and schedules to audit compliance with and effectiveness of the QA/QC requirements associated with QL-1 and QL-2 piping, including (but not limited to) design, procurement, receipt/storage, installation, and testing.

02.03 Determine whether licensee/contractor management has an established program for ensuring that all personnel involved in the above mentioned activities are suitably proficient, skilled, or otherwise qualified by experience or training to perform their assigned duties.

02.04 In three different QL-1 piping systems and one QL-2 piping system observe five piping activities relative to safety-related piping, such as handling; cleanliness control; installation of pipe spools, fittings, and bellows; cutting; grinding; bending; supporting; cleaning and flushing; hydrostatic testing; and quality-related inspections.

02.05 For those five activities selected for observation (in 02.04, above) determine whether the following requirements, as applicable, are met:

- a. conformance with construction/installation specifications
- b. personnel are adequately qualified by certification, experience or training
- c. conformance with inspection (QC) and work performance procedures
- d. conformance with record-keeping requirements
- e. identification and control of material
- f. control of nonconforming items

02.06 For one location (or run) in each of two QL-1 piping systems and one QL-2 system determine whether piping runs are (or are being) installed as required by applicable specifications, field drawings, and procedures.

02.07 For one QL-1 and one QL-2 piping system determine whether there have been significant design changes subsequent to the issuance of approved installation drawings. Review the implementation of the licensee's/contractor's design control measures, including the necessity for a revised stress analysis, as appropriate, to determine whether design control procedures were properly followed.

02.08 Review the pertinent quality related records of three parts (e.g., pipe spools, fittings, bellows) in a QL-1 piping system and two parts in QL-2 piping systems. Select no more than two components of any one size. Determine whether each record meets requirements related to:

- a. Confirming that required material characteristics, performance tests, environmental qualification tests, nondestructive tests, and other specification requirements were met.
- b. Confirming that the selected components were installed as specified.
- c. Confirming that the required inspections were performed.

02.09 Review any licensee/contractor procedures specifically for reporting and dispositioning nonconforming materials, parts and components associated with QL-1 and QL-2 piping and determine whether the procedures properly implement the QAP commitments. Review approximately 10 nonconformance/deviation reports to sample system effectiveness and determine if the procedures are being adequately implemented.

02.10 Determine whether appropriate qualification requirements are in place for licensee/contractor craft and inspection personnel being employed on QL-1 and QL-2 piping installation work. Determine whether personnel performing the work meet the qualification requirements by reviewing a sampling (4 to 6) records, covering several different disciplines of personnel qualification if possible.

02.11 Review relevant portions of licensee/contractor audit reports concerning the installation of QL-1 and QL-2 piping. Review two to four reports to determine whether the required audits have been performed in accordance with the requirements in the QAP and implementing procedures.

## 88134-03 INSPECTION GUIDANCE

### General Guidance

Requirements of this procedure apply to each organization installing QL-1 and QL-2 piping. Applicable parts of the CAR and Quality Assurance Plan (QAP) should be reviewed to determine licensee commitments relative to construction, inspection, and records requirements before performing this inspection. The inspector(s) should utilize the appropriate CAR section during the review of the licensee/contractor's implementing construction specifications, drawings, work procedures, and QA implementing procedures. Most of this review can be completed during inspection preparation within the regional office after the documents have been obtained from the site.

The purpose of the inspection requirements in Section 02 of this procedure is to determine whether the licensee/contractor(s) activities, other than welding and NDE, have met QA program requirements for piping receipt, fabrication, erection, inspection, and testing of QL-1 and QL-2 piping systems. Also, this inspection requirement should provide specific information about the licensee commitments, plans, and schedules for performing required comprehensive audits in the areas of interest listed above. Information should be obtained about audit procedures, checklists, auditor qualification, schedules, and the identification of those having direct audit responsibilities. Specific attention should be directed toward reviewing licensee actions for ensuring that only qualified personnel are permitted to perform the construction and inspection work covered by this procedure.

The licensee/contractor procedures involved may vary from contractor to contractor, and may take many forms, such as formal procedures, instructions, checklists, drawings, etc. Review the inspection procedures/lists and compare with the requirements in the applicable codes and construction specifications. Evaluation should indicate whether adequate quality-related inspections are established and are based on appropriate criteria, and further, whether the results of the licensee/contractor's inspection will be transmitted to responsible quality assurance and management personnel. The regional inspector must determine if the licensee controls are adequate and are properly implemented in a timely manner.

### Specific Guidance

03.01 For clarification, "Material Test Report" is a generic expression meaning a report of

test results to confirm that material, chemical and physical properties are consistent with the applicable specification. Vendor terms used, which can be identified with the expression "Material Test Report," include:

Ladle analysis (sample of molten metal)

Check analysis (sample of solidified metal)

CTR (Chemical Test Report or Certified Test Report)

MTR (Material Test Report - usually includes chemical and physical tests)

03.02 The generic terms CTR and MTR should not be confused with the term "Certification." A "Certification" is a document issued in lieu of actual quality documentation records stating that the quality requirements contained in specifications and purchase orders have been met.

03.03 "Quality Release Form" and "Certificate of Equipment" are examples of generic designations for forms used by manufacturers to serve as certifications of quality (in lieu of original quality documentation) for components and equipment.

03.04 The inspector should bear in mind that NRC's sample covers only a very small portion of the records involved. Thus, substantive errors or departure from requirements raise the issue of whether the licensee is adequately controlling the process.

03.05 The qualifications of those engaged in quality sensitive or special processes related to pipe installation, inspection and testing work should be sampled for an assessment of compliance with licensee commitments. Also, depending on the type and extent of design engineering work being performed at the site, it may be appropriate to review the qualifications of certain key individuals assigned to this design area.

03.06 A piping run, for purposes of this procedure, is meant to be a particular section of piping, for example: a piping section between components or major supports or relief valve discharge piping. The intent of requirement 02.06 is to determine whether piping is being installed according to properly approved drawings; either the original design drawings or properly approved revisions; and, if revisions are in process, that these changes are properly handled in accordance with established procedures.

Appropriate standards can be used as a guide in this area. For example, NQA-1 and the QAP require that where changes to previously verified designs have been made, design verification shall be required for the changes, including effects of those changes on the overall design. Also, changes made to piping during construction which may result in significant deviations from the (CAR) design should also be subject to a design verification. Such changes could result in an accumulation of design change documents and/or marked-up drawings. These documents reflect as-built conditions and should be adequately controlled so they will be readily available for future use especially during future evaluations of other design changes. Additionally, the as-built process should result in proper and timely updating of the original/master drawings and specifications to incorporate

such changes.

03.07 Prevalent errors and concerns. This section is included to provide background for inspectors on what past problems of a generic nature have been identified and is for information only.

- a. The status of protective measures at the time of site receipt and initial storage of piping and piping system components.
- b. Adequacy of dunnage for piping and piping system components during storage. Dunnage treated with fire retardants may expose pipe to excessive levels of halogens and chlorides.
- c. Continued adequacy of such things as end caps for piping and protective coverings for weld prep areas.
- d. Weather protection in the form of canvas or plastic covering. (In most deficient cases, the original protective covering was adequate, but inattention to damage and normal "wear and tear" led to substandard or unacceptable protective covers.
- e. Storage areas located on sandy soil require special attention to avoid the entry of wind-driven sand particles into piping components.
- f. Improper location of storage. In some instances, storage locations are selected without consideration for construction traffic patterns, or possible falling objects and/or missiles.
- g. Inadequate or illegible piping identification. (Damaged by handling and/or environment.)
- h. Stability of work force or QA/QC personnel and the attitudes in work crews and relations between construction personnel and QA/QC personnel.
- i. Power grinders used for weld preparation of pipe that result in violation of minimum wall thickness.
- j. Piping runs containing mud, sand, and other foreign material.
- k. Incorrect size orifices installed in pump recirculation lines.
- l. Surfaces for welding not properly free of paint, oil, rust, or other material that is detrimental to welding.
- m. Drawings or other records fail to show evidence of actual piping components installed in pipeline or are not a current revision.
- n. Piping changes without proper design change authorization.

- o. Repairs of linear indications on pipe spool pieces not properly performed as to testing for wall thickness and blending uniformly into the surrounding surfaces.
- p. Controls over the installation/removal of cleaning and flushing devices are inadequate.
- q. Refer to IE Bulletin 79-14 for additional concerns relating to as-builts.

#### 88134-04 RESOURCE ESTIMATE

This inspection procedure is expected to take, on the average, 24 to 32 hours for each review of licensee/contractor activities. The procedure should be run once early in the installation of piping relied on for safety, with primary focus on procedures and personnel qualifications. A second inspection should be conducted about mid-way in the installation of piping relied on for safety with the primary focus on observation of work and review of installation records.

#### 88134-05 REFERENCES

Duke, Cogema, Stone and Webster, Mixed Oxide Fuel Fabrication Facility, MOX Project Quality Assurance Plan (MPQAP), Docket Number 070-03098, under US Department of Energy Contract DE-AC02-99-CH10888, latest revision accepted by NRC.

Duke, Cogema, Stone and Webster, Mixed Oxide Fuel Fabrication Facility Construction Authorization Request, latest revision accepted by NRC.

10CFR50, Appendix B, Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants

10CFR70, Domestic Licensing of Special Nuclear Material

10CFR21, Reporting Defects and Noncompliance

Parts I and II of ASME NQA-1-1994, Quality Assurance Program Requirements for Nuclear Facility Applications, as revised by the ASME-1a-1995 Addenda

Regulatory Guide 1.28, Quality Assurance Program Requirements (Design and Construction), Revision 3

ASME B31.3-2002, Process Piping

END